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American Fern Journal

Vol. 12

JANUARY-MARCH 1922

No. 1.

Occurrence of *Botrychium matricariaefolium* in New Jersey

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The meager general knowledge on the occurrence of *Botrychium matricariaefolium*¹ in New Jersey and the consequent caution with which the species is accredited to the state in the most recent work covering this area—Mr. Norman Taylor's *Flora of the Vicinity of New York*—suggests the propriety of placing on record a more detailed and convincing statement of the verity of the reports published there, together with an account of certain older published records and of a goodly number of additional stations more recently discovered.

There are but these two stations admitted in the *Flora of the Vicinity of New York*:—

“N. J. Cranberry Lake, Sussex Co. (according to Mackenzie); reported from near Riddleton, Salem Co.”

From the care shown in the form of citation it might

¹ The Matricary Grape Fern is currently known in America under three names: *Botrychium neglectum* Wood, *B. matricariaefolium* A. Br., *B. ramosum* (Roth) Aschers. *B. neglectum* Wood is used by those who consider the American plant different from the European—a contention which has been upheld by various students, but has never been conclusively demonstrated. If the plants are considered to be conspecific, one of the other two names is to be employed. There is no possible doubt about the application of *B. matricariaefolium* A. Br., but this name is long antedated by *Osmunda ramosa* Roth, if that plant was really the same. There is apparently no extant type and *B. ramosum* (Roth) Aschers. is applied to the present plant (rather than to *B. Lunaria*) upon the basis of a very complicated argument, the verity of which is by no means entirely obvious. I am indebted to Mr. C. A. Weatherby for a comprehensive account of the status of these names. The above is a brief summary of a matter entirely too technical to be considered in this place.

[Vol. 11, No. 4 of the JOURNAL, pages 97-130, plate 2, was issued March 31, 1922.]

readily be conjectured that these records are based upon report alone. It may be stated at once, however, that they are both supported by authentic material.

The absence of any reference to the records in Dr. N. L. Britton's *Catalogue of Plants Found in New Jersey* attracts attention—especially in a work, such as Taylor's, giving careful consideration to all published records. They must have been omitted surely through oversight or accident. There are three records for the species published here in 1889:—

“Morris: Big Swamp, Madison—F. J. Bumstead. Sussex: Kittatinny Mt. near Walpack Centre—Britton & Rusby. Bergen: Tenafly—Leggett.”

The bases of these records naturally would be searched for in the State Herbarium, built up by Dr. Britton when upon the New Jersey Geological Survey, which is now in the care of the New Jersey Agricultural Experiment Station at New Brunswick. A recently obtained opportunity to examine the Botrychiums in this valuable collection—for which my thanks are due to the courtesy of Dr. Melville T. Cook—makes it possible to give detailed information about two of these records.

The Britton & Rusby material consists of a single specimen. This is a complete plant, in full maturity, about 14 cm. high, with very reduced frond. The sterile segment is lanceolate, shallowly few-lobed and is borne near the summit of the plant, closely clasping the fertile segment. This is the form that has been named *B. tenebrosum* A. A. Eaton—which, if not given distinctive rank, is to be referred, apparently, to *B. simplex*. The Bumstead record is based upon a sheet of four specimens, three of which are characteristic *B. matricariaefolium* but the fourth is *B. angustisegmentum*. The label reads: “Big Swamp, Madison, N. J., July 1866.” It would seem not unlikely that both species

were collected together.² Unfortunately the search for the Leggett material from Tenaflly has been unsuccessful. Dr. Britton, who distributed the Leggett Herbarium, has kindly written me that it is not in the collection at the New York Botanical Garden, though many of Leggett's specimens are preserved there. He would have supposed that it had been sent to the New Jersey Geological Survey, but if not there, his only and final suggestion is that it may have gone to some private collection.

Of Taylor's citations, the Riddleton record³ represents the first known station for the species in southern New Jersey and for more than a decade the only station in this portion of the state. There are two sheets of specimens of the plant in the Herbarium of the Philadelphia Academy, obtained at several times between 1894 and 1896 by different collectors. The material ranges from tiny plants of 4-5 cm. to well developed specimens of 20 cm. height. It appears that the plant was discovered at Riddleton by Mr. C. D. Lippincott of Swedesboro, who at that time was doing much original exploration in this part of New Jersey. This interesting discovery was at once shared with the Philadelphia botanists, and collections, made by Stewardson Brown, Joseph Crawford, and C. D. Lippincott, are preserved in the Academy Herbarium. The finest is that made by Mr. Lippincott July 4, 1896, a portion of which is also

² There is, however, an added complication, which may be put upon record, that on this sheet is another label (a small pencilled ticket) reading: "Englewood, May 23, 74." The *B. matricariaefolium* is in long over-ripe condition and the *B. angustisegmentum* in fresh maturity: this would be appropriate for these two species in July in upper New Jersey. The early date of May 23 is quite impossible for plants in the condition of maturity shown by these specimens and the view is here taken that this ticket has been misplaced and is not appurtenant. *B. angustisegmentum* is known from other collections to occur in Morris County and the two species, as is well known, not infrequently grow together—*B. angustisegmentum* maturing about a month later than its ally. In the consideration of these several specimens from the Herbarium of the New Jersey Geological Survey I have had the corroboration of Mr. Weatherby.

³ Keller & Brown, Fl. Phila. & Vic. 8 (1905).

contained in his private herbarium at Swedesboro, New Jersey. Since then the plant apparently has been lost sight of at Riddleton. In the spring of 1917 Mr. Lippincott guided me to the exact spot but the species was not found. The station, immediately south of the railroad stop, is in low woods (characteristically of Pin Oak) with very thin humus overlying a clayey, gravelly subsoil, and probably is continuously wet during the growing season of the grape fern. *Ophioglossum vulgatum* formerly grew in this same spot, and as it has since been found in two other nearby areas at Riddleton, probably the grape fern also will be rediscovered in time.

Not until the summer of 1905, apparently, was the species again seen in the state. From the energetic collecting of the late Professor C. S. Williamson of Girard College, Philadelphia, this unpublished record is to be obtained. At the Philadelphia Academy there is a sheet of two specimens bearing the label: "Sanatorium, Bethesda, Morris County, N. J., Aug. 2, 1905." In his own large private collection, now incorporated in the Herbarium of the Academy, there is additional material of the same collection.

Taylor's record for the northernmost county of the state follows here, chronologically. Through the kindness of the collector, Mr. Kenneth K. Mackenzie, I have been enabled to examine the basis of this record. The label reads: "Rich soil in rocky woods, Cranberry Lake, Sussex Co., N. J., June 9, 1907." Mr. Mackenzie tells me that a single plant was found in the woods bordering the lake, about a mile south of the railroad station. The specimen was verified by Miss Margaret Slosson several years ago at the New York Botanical Garden and is in the herbarium of Mr. Mackenzie at Maplewood, New Jersey.

During the Botanical Symposium held at Newton in July 1907 the species was found at least once. In Dr.

Philip Dowell's account⁴ of the meeting he notes it reported July 5, which day was spent on a trip to Swartswood Lake. There is material consisting of five good specimens at the Philadelphia Academy, labelled, in the hand of Mr. S. S. Van Pelt (who wrote the labels of most of the Symposium specimens deposited at Philadelphia) "Hillside between Swartswood and Newton, Sussex Co., N. J., July 5, 1907, S. Brown."

The plant seems not to have been collected again till 1913, when Mr. Harold Pretz and myself, on June 15, each succeeded in discovering a single specimen during the day's collecting along the Pequest River, southwest of Springdale, in Sussex County. Mr. Pretz's material, in his own herbarium at Allentown, Pa., is from "woods bordering wooded swamp." The data with my own specimen (probably from the same general vicinity) indicate "dryish maple woods"—the station coming to mind as a well-drained, gentle slope, with scanty undergrowth, lying between limestone cliffs and a wooded swamp. Both specimens are finely developed ones, my own measuring 26 cm above the ground. This same year and month Mr. Mackenzie continued the precedent of a single plant to a collection in discovering a specimen along the Delaware River, a couple of miles above Water Gap station. The material, in the collector's herbarium, is labelled: "Dry slopes above Water Gap, Warren Co., N. J., June 23, 1913." It has been examined by Miss Slosson.

During the explorations for Dr. Witmer Stone's *The Plants of Southern New Jersey* it had been realized what a host of characteristically upland species were waiting to be discovered in the northern corner of Burlington County. Here, previously to 1911, had been found such unusual plants for a coastal plain area as *Ostrya virginiana*, *Hydrangea arborescens*, *Chenopodium Bos-*

⁴ Dowell, *Torreya*, vii, 167 (1907).

cianum, *Viola rotundifolia*, and *Galium lanceolatum*. Consequently, after more or less continuous work in this region, the detection of *B. matricariaefolium* here in 1915 at two localities had lost somewhat the element of surprise which it would have occasioned some years earlier.

The discovery of the plant May 12 along Blacks Creek, southeast of Bordentown, is connected with an incident familiar enough to all collectors but never becoming commonplace. I had been collecting along the steep slopes bordering the creek, and desiring a comfortable spot to put in press an armfull of various specimens, I climbed to the crest of the slope, and on a grassy spot, under scattered trees, by a rill, sat down, opened my press and found the grape fern almost under my hand. Search as I might, however, only two small specimens could be found. The other station is along the Delaware River at Kinkora. There are several streamlets here which have cut narrow gullies through the steep terraces of the Delaware. Exploration, on several occasions, of the rich wooded slopes of these gullies has invariably brought to light upland species of special interest to southern New Jersey. To an already considerable list was added *B. matricariaefolium* on May 27. The underlying soil of these slopes is clayey and the rich humus from an abundant vegetation often slides from the steeper portions and collects on the more level spots. In such a habitat was found a small colony of the grape fern. Most of the specimens were of medium size, the largest being 15 cm. high.

The botanizing in early spring often consists more of exploration than of actual collecting, and at least a cursory examination is frequently given many a spot which later in the season would escape notice. The green slopes of an old pit near Sewell, in Gloucester County, brought to recollection, on a wintery day in

April 1916, the long-standing query whether the green sands of the Marl Belt do not harbor some peculiar species. This glauconite exposure, on being followed, led into moist, rich, marly woods along a rill tributary to Mantua Creek. The very first discovery was the pale-green, closely folded-up fronds of *B. matricariaefolium*, standing out conspicuously above the brown woodland carpet of dead leaves. Over a dozen plants had already come to sight, but the tallest had scarcely attained 5 cm. and most of those detected were just appearing above the ground. As it seemed not unlikely that the colony might prove to be larger than was then apparent, it was again visited, on Memorial Day, and found to cover a much greater area and to contain about three times as many plants. Excellent specimens as tall as 25 cm. were collected this date, May 30.

There are few places in southern New Jersey more familiar to Philadelphia botanists than Clementon—probably because here in Camden County the edge of the fascinating Pine Barrens approaches nearest to the city. A genuine surprise was experienced in 1919 in finding this grape fern at Clementon in dry, open, sandy thickets on the border of pine woods. By all precedents it should be absent from the Pine Barrens, but the associated Pitch Pine, Sassafras, Sweet Fern and Bracken are the characteristic types of the nearby, undoubted Pine Barrens. However, equally near was a marshy spot of the Middle District⁵ with such characteristic species as *Panicum microcarpon*, *P. clandestinum*, *Habenaria lacera*, and the rare *Geum strictum*. And moreover, the prevalence of Green Brier about the grape ferns indicated the Middle District. A half-dozen or more plants, appearing like little clenched fists, already had pushed through the loose sand on April 14. When the colony was seen a month later

⁵ See Stone, The Plants of Southern New Jersey. Ann. Rep. N. J. State Mus. 1910, 57 (1912).

about double the number of plants was found and the largest had become 15 cm. tall, with finely developed frond.

The most recent discovery of the species, to my knowledge, was made by Mr. Ludlow Griscom, of the American Museum, in company with Mr. Mackenzie. Some scores of plants were found along an old wood-road, grown up with bushes, in the hills along the Delaware River below Dingmans, Sussex County, New Jersey, June 20, 1920. Mr. Mackenzie's material is of excellent specimens in prime condition, some approaching 30 cm in height—probably as handsome as has ever been collected in the state.

A fair distribution is thus outlined for what has been considered one of New Jersey's rarest fernworts: from the upland regions of northern New Jersey southward through the Middle District of the Coastal Plain into Salem County. Its occurrence further south is by no means improbable but a great number of upland types apparently reach their southern limit in the state in Salem County. Undoubtedly other intervening stations between Dingmans and Riddleton will continue to be discovered, and a greater frequency found in the northern counties.

One of the most interesting points, however, which these notes bring forth is the great diversity of habitats shown by the species—ranging from low, wet woods, or rich, rocky woods containing limestone outcrops to dry, sandy thickets. The differences are certainly more obvious than the similarities: in fact, it is difficult to find a point of similarity in the character of the various habitats except that of shade. As was discovered in the case of *Ophioglossum vulgatum* by the symposium in the AMERICAN FERN JOURNAL, this ally of the Adder's Tongue likewise not only tolerates, but flourishes under, the most varied conditions.



BOTRYCHIUM DISSECTUM WITH THREE FRUITING PANICLES.

But when viewed from the standpoint of soil chemistry, possibly a correlation may be found in the apparent diversity of habitats. Dr. Edgar T. Wherry tells me that, in the case of two stations in Vermont which he was able to test, the soil in which the species grew gave a moderately acid reaction. He believes that the soil of the wooded slopes of the Delaware River would give a similar reaction, and suggests that even the Springdale station, near limestone cliffs, would probably be of an acid character from the humus in which the plant grows, while the Clementon locality would undoubtedly be acid—and probably of a high grade of acidity. It may thus at least be suggested that, until conclusive work has been done on the species along this line of research, *B. matricariaefolium* probably shows a preference for acid soils.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

Is *Botrychium dissectum* a Sterile Mutant?

The accompanying illustration of a plant of *Botrychium dissectum* bearing no less than three well-developed fruiting panicles would seem to answer the above question emphatically in the negative so far as sterility is concerned. Certainly, this individual is doing all that could reasonably be expected of it to avoid that condition. Normally, of course, the *Botrychiums* of the *tornatum* group fork once near the ground, one branch bearing a sterile and the other a fertile segment. In this case, the forking has been repeated higher up and a secondary fertile branch given off which has itself divided just above its base producing two secondary fruiting panicles somewhat smaller than the primary one. Such compound forms are occasionally found in *obliquum*; I have a specimen collected at South Windsor, Conn., by C. W. Vibert in which the branching exactly